

WHAT IS CLAIMED IS:

1. A manufacturing method for a substrate with carbon fiber fixed thereon, performed with an apparatus including a first chamber having an anode containing carbon and a cathode, disposed facing one another, and a second chamber communicated to said first chamber through a transporting tube, said method comprising:

setting the pressure in said second chamber lower than the pressure in said first chamber;

forming carbon fiber by generating arc discharge between said anode and said cathode; and

ejecting said carbon fiber generated in said first chamber from the end of said transporting tube disposed within said second chamber so that said carbon fiber collides with said substrate, using the pressure difference between said first chamber and said second chamber.

2. A manufacturing method for a substrate with carbon fiber fixed thereon according to Claim 1, including supplying a non-oxidative gas into said first chamber.

3. A manufacturing method for a substrate with carbon fiber fixed thereon according to Claim 1, including employing in said anode a catalytic material.

4. A manufacturing method for an electronic device comprising an electrode having carbon fiber, performed with an apparatus including a first chamber having an anode containing carbon and a cathode, disposed facing one another, and a second chamber, in which a substrate having electrodes is disposed, communicating to said first chamber through a transporting tube, said method comprising:

setting the pressure in said second chamber lower than the pressure in said first chamber;

forming carbon fiber by generating arc discharge between said anode and said cathode; and

ejecting said carbon fiber generated in said first chamber from the end of said transporting tube disposed within said second chamber so that said carbon fiber collides with said electrodes on said substrate using the pressure difference between said first chamber and said second chamber.

5. A manufacturing method for an electronic device employing electrodes having carbon fiber according to Claim 4, including supplying a non-oxidative gas into said first chamber.

6. A manufacturing method for an electronic device

employing electrodes having carbon fiber according to Claim 4, including employing in said anode a catalytic material.

7. A manufacturing method for an electronic device employing electrodes having carbon fiber according to Claim 4, including employing an electron-emitting device as said electronic device.

8. A manufacturing method for a display having a plurality of electron-emitting devices comprising:

preparing a first chamber having an anode containing carbon and a cathode, and a second chamber which are communicated each other with a transporting tube;

arranging a substrate having electrodes in said second chamber;

setting the inside pressure of said second chamber lower than the inside pressure of said first chamber;

forming carbon fiber by generating arc discharge between said anode and said cathode; and

ejecting said carbon fiber generated in said first chamber from the end of said transporting tube disposed within said second chamber so that said carbon fiber collides with said electrodes on said substrate using the pressure difference between said first chamber and second chamber.

9. A deposition apparatus for carbon fiber comprising:
a first chamber;
a transporting tube;
a second chamber communicated to said first chamber
through said transporting tube;
an anode containing carbon disposed within said first
chamber;
a cathode disposed within said first chamber, facing
said anode containing carbon; and
pressure control means for keeping the pressure in said
first chamber greater than the pressure in said second
chamber.

10. A deposition apparatus for depositing carbon fiber
comprising:
(a) an anode including a carbon electrode;
(b) a cathode facing said anode; and
(c) a conduit having a nozzle for ejecting therefrom
carbon fiber formed by arc discharge between said anode and
cathode in an inert gas, as a jet to form carbon fiber on a
substrate.

11. An apparatus for depositing a film-containing
carbon fiber according to Claim 10, said apparatus further

comprising:

- a transporting tube;

- a carbon fiber-generating chamber including

 - an anode formed of a carbon material,

 - a cathode disposed with a predetermined distance to said anode for causing said arc discharge between said anode and said cathode so as to heat and evaporate said carbon material,

 - a suction opening of said transporting tube disposed above the evaporation source, and

 - an inert gas introducing unit,

- a carbon fiber film-forming chamber including

 - a nozzle connected to the end of said transporting tube,

 - a substrate disposed facing said nozzle, and

 - an inert gas exhaust unit;

wherein carbon nanofiber generated by the heating and evaporating is transported along with said inert gas due to the pressure difference between said carbon fiber-generating chamber and said carbon fiber film-forming chamber through said transporting tube for ejecting as a jet from said nozzle, whereby a carbon fiber film or a lump containing carbon fiber is formed on said substrate.

12. A deposition method for depositing a film

containing carbon fiber on an object comprising:

(a) generating an arc discharge between an anode including a carbon electrode and a cathode disposed facing said anode in an insert gas atmosphere to form carbon fiber by evaporation of carbon;

(b) simultaneously dispersing the carbon fiber in the insert gas;

(c) ejecting the carbon fiber dispersed in the insert gas from a nozzle to form the film.

13. A deposition method for a film containing carbon fiber according to Claim 12 employing an apparatus comprising:

a transporting tube;

a carbon fiber-generating chamber including

an anode formed of a carbon material,

a cathode disposed with a predetermined distance to said anode for causing arc discharge between said anode and said cathode so as to heat and evaporate said carbon material,

a suction opening of said transporting tube disposed above the anode, and

an inert gas introducing unit;

a carbon fiber film-forming chamber including

a nozzle connected to the end of said transporting

tube,

a substrate disposed facing said nozzle, and
an inert gas exhaust unit;

wherein carbon nanofiber generated by heating and evaporating said anode is transported along with said inert gas due to the pressure difference between said carbon fiber-generating chamber and said carbon fiber film-forming chamber through said transporting tube so as to be ejected as a jet from said nozzle, so that a carbon fiber film or a lump containing carbon fiber is formed on said substrate, whereby a film containing carbon fiber is formed on said subject.